

# **Familiarize Yourself with IPMVP**

Any organization contracting for large energy efficiency projects should be familiar with the International Performance Measurement and Verification Protocol (IPMVP). Although the word “large” is a relative term, for educational institutions that is probably going to mean projects that cost over \$100,000. Information on IPMVP is easy to obtain. You can download a copy from their web site at: <http://www.ipmvp.org>.

## **Purpose of IPMVP**

### **“How can I be sure I’m really saving money?”**

The purpose of IPMVP is to answer this question. IPMVP provides a “framework to determine energy and water savings resulting from the implementation of an energy efficiency program.” The framework provided by IPMVP has become the industry standard for savings verification. This article is concerned with *Volume I, Concepts and Options for Determining Energy and Water Savings*. Other volumes address the subjects of monitoring the performance of renewable energy systems and enhancing indoor environmental quality in buildings.

According to the IPMVP, it provides “an overview of current best practice techniques available for verifying results of energy efficiency, water efficiency, and renewable energy projects.” Volume I addresses energy conservation measures that reduce energy through the installation or retrofit of equipment or the modification of operating procedures.

Because energy consumption and costs are often “invisible” to all but a very few administrators, a very important question arises when considering energy efficiency projects, “how can we know what we are really saving?” Large energy efficiency contracts should include at least some of the elements recommended in the IPMVP. Often these contracts include a savings guarantee that pays for part or all of the costs of the project. The IPMVP provides a very credible guidance to help the project administrator verify that savings have occurred and how much has been realized.

## **Key Points**

According to *Environmental Energy Technologies News*, Lawrence Berkeley National Laboratory, “use of IPMVP has become standard in almost all energy efficiency projects where payments to the contractors are based on the energy savings that will result from the implementation of a variety of energy conservation measures (ECM’s). IPMVP has been translated into ten languages. More than 300 professionals from 100 U.S. and international organizations have contributed thousands of hours on a completely voluntary basis to update and revise IPMVP.” Although the volume is large and somewhat technical there are several sections that administrators should be familiar with.

- Savings Measurement
- Measurement Options
- The Measurement & Verification Plan
- Third Party Verification
- Valuation of units of utility resource savings

## **Savings Measurement**

There is a very simple formula for measuring savings:

$$\text{Energy Savings} = \text{Base Year Energy Use} - \text{Post Retrofit Energy Use} + \text{or} - \text{Adjustments}$$

It is very important to understand where these numbers come from and especially how adjustments will be applied. Adjustments are made in order to more realistically compare post retrofit conditions to the base year conditions (significant changes in square feet, weather differences, operational hours, and the addition of other loads that did not exist during the base year). If these factors were not accounted for, it is possible that savings would be improperly calculated too low or too high. The use of adjustment factors yields savings that are often referred to as “avoided” energy use of the post retrofit period.

## **Measurement Options**

There are four approaches to measuring savings that are termed “Options A, B, C, and D.” These are the cornerstones of the standardized set of procedures contained in the IPMVP. This group of options can be divided in to two main categories.

### **Options A and B (Isolation Retrofit Approach)**

Options A and B focus on the performance of specific ECM’s such as items of equipment and installed retrofits that can be measured in isolation from the rest of the building. Before and after measurements are taken and compared to determine the savings. A lighting retrofit is a good example for Option A. Installation of variable speed drives is a good example for Option B.

### **Options C and D (Whole Building Approach)**

These options are used when the nature of the ECM is not easily measured in isolation from the rest of the building operations. This could be typical of operational and control changes that affect many areas of the building. The Option C approach assesses savings at the whole-facility level by analyzing utility bills before and after the implementation of the ECM’s. Option D uses computer simulations and modeling of the whole facility, usually when base year energy data is not available or reliable. Installation of energy management control systems (EMS) and training/awareness programs are good examples for Option C. Generally, Options C and D involve much more time and skill to conduct and, therefore, are going to be more costly to measure.

## **Measurement and Verification (M&V) Plan**

According to the IPMVP, “an M&V Plan is central to proper savings determination and the basis for verification.” The M&V Plan “fundamentally defines the meaning of the word ‘savings’ for each project” and should include the following elements:

- A description of the ECM and its intended result
- An overview of the intended IPMVP option to be used that applies to the ECM’s to be employed, documentation of pre-ECM or base year operating data, design of the energy savings program, and the boundaries of the savings determination
- Measurement methods and equipment to be used
- Commissioning of the newly installed ECM’s
- Documentation of post ECM energy and operating data
- Savings report
- Costs of M&V operations and equipment

The IPMVP provides an extensive list of other elements to be included in an M&V Plan depending on the nature of the project.

### **Third Party Verification**

According to the IPMVP, “where the firm performing the energy savings determination has more experience than the owner, the owner may seek assistance in reviewing savings reports.” This should begin at the time that the M&V plan is being developed.

This is especially important for contracts where a guarantee of savings has been included so that both parties believe the information that determines the payments is valid and accurate.

### **Valuation of Units of Utility Resource Savings**

The IPMVP section that relates to Energy Prices is quoted in its entirety:

“Energy cost savings may be calculated by applying the price of each energy or demand unit to the determined savings. The price of energy should be the energy provider’s rate schedule or an appropriate simplification thereof. Appropriate simplifications use marginal prices which consider all aspects of billing affected by metered amounts, such as consumption charges, demand charges, transformer credits, power factor, demand ratchets, early payment discounts.”

It is highly advisable that you do not permit the use of “average unit costs” for energy savings, as you will run the risk of significantly over stating actual savings.